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In this issue . . .

Réculer Pour Mieux Sauter?	769
Time-Saving Methods in Modern Smelteries	772
Hydraulic Drive — The Modern Transmission	774
Mining Miscellany	776
Technical Briefs	778
Metals and Minerals	779
Mining Finance	780
Company Meetings	782
Professional Directory	783
Publications Received	784

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Réculer Pour Mieux Sauter?

IN the mining and metal industries the year now ending will be remembered chiefly for the precipitous falls which took place in the prices of many metals and minerals, led by copper.

Very broadly speaking, it can be said that the sluggish and declining metal markets characteristic of 1957 are not the result of reduced consumption, but of expanded production and the tailing-off of stockpiling coupled with the failure of consumption to continue rising at the pace of previous years.

At the close of 1956, the supply-demand picture for most major metals had reached, or was rapidly approaching, a state of approximate equilibrium after years of scarcity. Copper had fallen from its peak of £437 in March to finish the year in the region of £275, but producers still hoped for the stabilization of prices at a level which would encourage consumption while providing adequate profit margins for the higher cost mines. The past twelve months have seen a further fall of the price, and it remains to be seen whether the price, now fluctuating between £180 and £190, has finally touched bottom.

The year has been equally cheerless for producers of lead and zinc ores, who have seen the prices of these metals fall in the course of twelve months from roughly £117 to £73 for lead and £103 to £63 in the case of zinc. Anxiety has been increased by agitation in the U.S. for restrictive measures in the form of quotas or higher tariffs on imported lead and zinc. The Commission appointed by the U.S. Government to enquire into this highly controversial question has yet to present its report. Its recommendations are awaited with considerable apprehension by lead-zinc producers in the various Free World countries which derive substantial dollar revenues from sales of these commodities to the United States.

By virtue of buffer stock buying under the International Tin Agreement, the tin industry has enjoyed relatively stable prices at between £796 and £730. Towards the end of the year, however, it became necessary to call upon producers to provide their second cash contribution to the buffer stock, and early in December a meeting of the International Tin Council was convened, at which it was resolved to restrict tin exports during the first quarter of 1958 to 27,000 l.tons, and it seems likely that producers may have to cut back by an average of as much as 15 per cent during 1958 and in some countries by considerably more.

Aluminium producers, who had been looking forward for several years to the time when adequate supplies of metal would permit the more active development of civilian uses, found quite suddenly that their wishes had been granted on rather too generous a scale. Despite vigorous campaigns of sales promotion, the transition from scarcity to abundance, coinciding as it did with less favourable market conditions, led to an embarrassing situation for the U.S. Government, which found itself called upon to take up large tonnages of surplus metal under the so-called " puts " clauses of contracts entered into at the time of the Korea War to accelerate the expansion of production, when the possibility of overmuch aluminium seemed indeed remote.

For several years the official prices quoted by the two leading platinum refiners were substantially lower than the so-called "free market prices". This year declining demand for platinum, due largely to a falling off in orders from the oil industry, have resulted in two reductions in the official price, which is now quoted at £28 10s. compared with £34 in December, 1956, and Rustenburg Platinum Mines—the world's largest producer of platinum metals—is cutting production back to approximately 60 per cent of last year's figure.

Even nickel, which until quite recently commanded fantastic premiums on the free market, appears to be on the threshold of temporary over-supply. The quantity of metal available to U.S. industry now exceeds requirements and we are assured that in 1958 European needs can also be fully met, assuming that they remain at the present level. Evidently the time has at last arrived for the nickel producers to bring out the large number of potential new uses for their metal which, we are assured, have been "in cold storage" for several years.

Viewed from a broader angle than the behaviour of the metal markets, the present pause in the expansion of the Free World economy appears to stem fundamentally from attempts to halt the inflationary spiral which had come to be widely regarded as the unavoidable price of prosperity and expansion. Whether one can have one's cake and deflation too has yet to be seen, but government policy in Canada and the U.S., no less than in Britain, has sought to take the wind out of the economy by such devices as high bank charges, credit restrictions and cuts in government spending.

Besides directly affecting investment projects, the policy of making capital more scarce and costly to raise has been psychologically harmful to enterprise. Eyes have been riveted, perhaps over-anxiously, on Detroit, the Dow Jones indices, and the ingot-operating rate of the U.S. steel industry. When the hoped-for pick-up in steel and motor car production in the fourth quarter failed to materialize, business sentiment in the U.S. veered abruptly from a perhaps excessive optimism to an equally unwarranted pessimism.

In this unpropitious climate the downward drift of ore and metal prices consequent on the improved supply position reached levels which, in the halycon days of inflation, were hardly expected to return. Faced with an uncertain outlook and the general trend towards lower profit margins, many metal users have apparently been living on their stocks, in the hope that prices would continue falling. So far as both steel and copper are concerned, consumers' inventories are substantially lower than when the year began, and to a greater or lesser extent consumers of most other commodities have also been living on their fat.

Metal markets have been further depressed by increasing offers of metal from the U.S.S.R. and other Communist countries—e.g., platinum, antimony and tin. In spite of rumours, there is no evidence that these offerings of Russian metal are inspired by political motives.

Another important development in both the U.S. and Britain has been the changing emphasis in defence manufacture from manned aircraft to guided missiles. Government orders for the development and production of aircraft have been reduced, but missile programmes are not yet under way. In any event, the production of guided missiles will absorb smaller tonnages of metals, supplied to increasingly exacting specifications.

One of the greatest sufferers from the change over from aircraft to missiles has been titanium. For the first time since the start of commercial production the titanium industry has gone into reverse. In the U.S., output of both sponge and mill products has been steadily declining, a pilot plant in Britain has closed down, while Japanese exports of titanium sponge to the U.S. have been drastically cut. In the long run present difficulties may bring lasting benefits to producers, since titanium's great possibilities in fields other than aircraft manufacture cannot be fully realized until sufficient supplies of high-grade metal are available to justify widespread experiments and research.

Meanwhile, the lower tempo of titanium metal production is causing yet another headache for the Australian beach sand industry. Australian rutile is now quoted in London at £42 - £44 a ton, which is less than half its former price. With growing interest in ilmenite as a possible starting material for titanium metal, the outlook for Australian producers is at present bleak indeed.

It is noteworthy that throughout the Free World the mining industry as a whole, despite shrinking profit margins and the difficulties of raising capital, is pushing on with expansion projects, confident that in the years ahead the world will need all the metals and minerals that can be provided. Exploitation of the Cape Yorke bauxite deposits —Australia's greatest mineral discovery for many years— is to be undertaken by Consolidated Zinc. In Canada delegates to the Sixth Commonwealth Mining and Metallurgical Congress were deeply impressed by the astonishing tempo of mining expansion throughout the Dominion, which reaches its most spectacular peak in Inco's $175,000,000 Manitoba project, scheduled to start production in 1960. Unshaken confidence in the long-term outlook is demonstrated by the immense scale of prospecting and aerial mapping climaxed by the gigantic "Operation Overthrust".

In the Central African Federation and the East African territories, prospecting activity by big mining combines and smaller concerns continues to increase and air reconnaissances are in progress over enormous tracts of country. In Northern Rhodesia programmes for the expansion of the copper mining industry remain substantially unchanged, but the Rhodesian Selection Trust has cut output by 10 per cent and there has also been some involuntary reduction in the planned output of the Anglo American group through such transitory circumstances as the difficulties encountered at Bancroft and the industrial dispute on the Copperbelt in July.

In French West Africa substantial progress has been made this year towards implementation of the various projects for the establishment of an aluminium industry based on local bauxite reserves and low-cost hydro-electric power. At Edea, in the Cameroons, the production of aluminium has already started, an output of 10,000 tonnes being expected in 1957. International groups under French leadership have been formed to establish in French Guinea initially the production of alumina from bauxite and ultimately the electrolytic reduction of alumina to aluminium.

Complementary to, rather than competitive with, these developments, will be Belgium's project for a series of dams and power stations to be built at Inga, on the lower Congo river. This project, which will provide a total of some 25,000,000 kW., envisages the creation of an "African Ruhr" where aluminium, electro-chemical and other industries would be established.

Further north, in the Sahara Desert, France's search for oil has met with sufficient success to interest international oil companies, who are actively participating in exploration. The fruits of exploration in the Sahara are by no means confined to oil, for it is becoming increasingly evident that the Desert is a rich reservoir of mineral wealth which, if exploited on an adequate scale, could be of inestimable value to France's ailing economy and to the world, given political peace.

At the Southern end of the African Continent, the South African gold mining industry, having made a highly profitable crossing of the Vaal river some years ago, is now

looking south-eastwards to the eastern border of the Orange Free State in search of pastures new.

During periods of disinflation, when industrial shares have lost their attraction for investors, gold traditionally comes into its own. Despite excellent results from the Orange Free State—the December quarterlies being particularly good—and the high values disclosed at Ashanti, the revival of investor interest in gold shares has been slow in coming, but substantial gains have nevertheless been recorded, particularly by the younger producers. Certainly the happiest investors today are those with a large holding of gold shares in their portfolio.

This year the South African Minister of Finance did not make his usual plea at Washington for an increase in the price of gold. It does appear, however, that the climate of economic opinion, even in the United States, is becoming more favourable to a rise in the gold price, having regard to the growing emphasis which is being placed on the importance of "honest" pounds and dollars.

Meanwhile, South Africa's revenue from gold mining continues to rise with the expansion of production in the O.F.S. and the increasing returns from uranium recovery. The Union's production of uranium is now in the region of some 6,000 tons a year valued at about £35,000,000. In Canada, several of the largest uranium mines in the Blind River area came into operation during the year and others are rapidly approaching production. Canada and the U.S. are each producing about 8,000 tons of uranium a year and planning to increase output to about 15,000 tons, while Australia's uranium industry is also making rapid progress. Production has been started at Rhodesia's first uranium plant.

Uranium producers are understandably viewing with some anxiety the possibility of a difficult period a few years hence, when they are no longer sheltered by the existing contracts. In this connection it is noteworthy that the Combined Development Agency has decided not to purchase the prospective uranium output from Klerksdorp Consolidated Goldfields. The uranium industry should be greatly encouraged, however, by the spectacular progress of nuclear power generation, particularly in the United Kingdom. In March this year it was announced that Britain would spend £919,000,000 on nuclear power stations by 1965, compared with the original estimated expenditure of £300,000,000 given in the White Paper in 1955. Contracts have already been awarded for several nuclear stations, of which the largest is Hinkley Point. Even if the credit squeeze necessitates some staggering of this immense programme, the magnitude remains indeed impressive. Moreover, U.K. manufacturers of atomic power plant have already received export orders for complete nuclear stations and expect that by the end of next year their contracts from abroad will be worth between £170,000,000 and £195,000,000.

The atomic energy programmes in Britain and the U.S. have given a further impetus to the development of beryllium, zirconium and others of the "newer metals". The increasingly exacting demands of technologists and the growing interest in by-product metals is reflected by the accelerating tempo of progress in extractive metallurgy, which is being stimulated by the guided missiles programmes and by the competition in sputnik launching. At the time of writing the Russians are two up!

As 1957 draws to a close the economic outlook remains "spotty", cloudy, and difficult to forecast. Of the less favourable factors in the present situation perhaps the most disturbing is the impact of low metal prices on countries whose prosperity is critically dependent on mine and metal production as a source of foreign exchange. Northern Rhodesia, for example, derives 60 per cent of its revenue from copper.

Clearly, the fact that a number of the countries most seriously affected by the decline in metal prices are in the sterling area requires to be weighed very carefully against the benefits arising from the high bank rate, less the gains resulting from the strengthening of the pound be offset by the reduced purchasing power of many sterling countries.

Apart from the danger that loss of export revenue might lead to restrictions on imports, it is inevitable that in a prolonged period of low metal prices, the reduced incomes of countries which are predominantly exporters of raw materials must sooner or later be reflected by cuts in development programmes and in purchases from the industrial nations. This is the classical pattern of recession, which, once started, is liable to have a snowballing effect. Moreover, unemployment and hardship, such as must arise from reduced mining activities, lead to hunger and discontent, the breeding ground of Communism and revolution.

So far as individual mining companies are concerned, it has yet to be seen how far the effects of falling prices will be offset by the saving in taxes accruing to those concerns which qualify as overseas trading corporations, in terms of the long-sought and very welcome concessions announced by the Chancellor in his budget speech.

It has so happened that the Commonwealth's two youngest self-governing members, Ghana and Malaya, have achieved their independence at a time when economic problems are adding to the political difficulties with which the birth of a new nation is always attended, thus making still more exacting demands on the statesmanship of those responsible for their guidance at what is bound to be a critical period in their history.

Fortunately there are strong reasons, however, for believing that the "rolling re-adjustment" of the Free World economy will not be allowed to roll down too steep a slope. In both the U.S. and Canada, the authorities are now trying to restore its forward momentum by a return to cheaper money. U.S. industry can also expect to benefit from an appreciable stepping up of defence expenditure, proving that it is indeed an ill-sputnik which blows no good—though it scarcely appears to have produced a favourable climate for the NATO summit conference, at which the majority of member-nations showed a greater desire for a new approach to Russia than for the establishment of bases for guided missiles in their own territories.

Meanwhile, there has been little indication—save perhaps for a temporary surfeit of automobiles—of any marked reduction in the consumer spending which—even more than investment—is the life-blood of America's economy. In Britain the Chancellor of the Exchequer has repeatedly emphasized that the purpose of the 7 per cent bank rate and credit squeeze is not to restrict but to provide a sounder foundation for future expansion.

Despite the fall in U.S. steel production and other "bearish" factors in the American economy, *réculer pour mieux sauter* appears to be the present theme-song of Free World economy. Though it has yet to be seen how quickly the tap of economic advancement can be turned on and off, there appears to be a widely held belief that 1958 will see a brisk resumption of the forward march. In a world where population and living standards are rising as rapidly as defence expenditure, there can scarcely be any very lasting contraction of markets and prices in the years ahead. In Britain we have even seen the mountain coming to Mahomet in the form of a 50-strong Canadian mission in search of potential supplies for orders.

Once confidence has again been fully restored, the chief limiting factors are likely to be money, labour and production capacity, rather than markets and orders. As Cecil Rhodes might have said: "So much to be done, so little capital to do it with!"

TIME-SAVING METHODS IN MODERN SMELTERIES

By C. C. DOWNIE

The chain-belt system of working appears to have been developed more widely for metallurgical processes in the U.S.A. than in any other country in the world. Some of the methods adopted by smelteries on the Continent hold specific advantages, but the continuous or non-stop method of operating has not so far been developed to the same degree. The fact that molten or heated products had to be dealt with, may have been partly responsible for this, but the co-operation of American engineering firms has done much to expedite nearly all smelting activities on a time-saving basis.

EVEN the smaller U.S. metal refineries adopt the chain-belt system of working, practically unknown in the United Kingdom. For example, the layout of one small activity showed the oil-fired reverberatory furnaces for melting down baled copper wire, and scrap copper, brass, etc., in a specific location, to allow a system of rollers to surround the hearths.

The molten metal when ready for tapping runs through a pot of hot coke into an arrangement which allows an aliquot portion to fill each individual mould. These are moved exactly to position as mounted on the rollers by an eccentric motion, and by the time they have reached the cooled stage, they are emptied into a water tank. Hence with the tapping times suitably allocated, it is possible to have the roller system in more or less continuous use, thereby saving time and labour.[1] A somewhat similar arrangement has been developed on a more elaborate scale in the large refineries.

Matte from the blast furnace passes through settlers to converters, where it is blown to blister copper of some 98 per cent purity upwards. This is elevated to an upraised anode casting device, from whence it is cast into bone-ash-lined anode moulds mounted on a circular casting machine. Each movement of this unit brings a flat mould into line with the spout, while at the cooler-end, a pin or bolt causes the now solid anode to be raised.

The shoulders of the anode are thus exposed, thereby permitting a hook from an overhead travelling crane, or a tong arrangement, to lift it on to a truck, which takes a charge of anodes direct to the electro-refinery. As the baths in this refinery are operated on a fixed time schedule, one bath is always ready to receive its allocation of anodes from the trucks. On arriving, with the truck shunted up the line to this location, another travelling crane is responsible for placing a set of anodes in position in the bath.

Despite the general slowness of electro-refining, the extensive nature of the refinery makes good, as baths which have been emptied are always available for a fresh charge, whereby the desired non-stop basis of working is maintained.[2] Another of the large smelteries, while following the foregoing system, also applies it to the lead refinery, but in a different manner, as a subdivision is made between the different lead products. Reclaimed lead, or lead recovered from existing scrap, is softened in the usual manner, and subjected to the familiar Parkes process.

The majority of the lead, which initially hails from ores, besides the sludges from copper electro-refining, is first dealt with in oil-fired rotary furnaces, and following skimming treatments to remove tin and antimony, is subjected to electro-refining, as also is the reduced tin, on the same non-stop basis. The fluosilicate electrolytes used here, however, are more slowly dealt with, and to meet which contingency a greater number of smaller baths are used in place of the large ones engaged in copper refining. The object is more one of directly recovering the silver and precious metals, since pyro-refined lead is sufficiently pure for most industrial purposes. As before, no time is lost in getting the crude lead cast as anodes for directly conveying to the refinery.[3]

Wide Range of Processes

Time-saving is a feature of another of the large refineries to an even more elaborate degree, where the by-products of each process pass to another section for non-stop treatment. Besides the main item of handling ores, all kinds of secondary material from scrapped car radiators, batteries, and lamps, etc., to accumulated metalliferous wastes generally, are dealt with in conjunction, and according to a pre-arranged schedule. The remains of anodes, strips, mechanically defective wire, and other scrap are accumulated in a large heap outside a 300 ton oil-fired reverberatory furnace, while a fork-charger, operated electrically, ensures the well of the hearth being filled up. At the "hot" end, tapping to form anode plates is done as before, but here a sufficient set of finished anodes is fitted to a bracket suspended by a crane, immersed in water (with the evolution of much steam), and the complete set fills one electro-refining bath.

The large nature of the operations justifies the same speedy treatment of the anode sludges, which in turn are converted to smaller anodes by melting, when some 100 tanks are engaged to remove the silver of 999.9 purity, on the same non-stop basis. Unlike practice elsewhere, the gold content in the recovered sludges is relatively small, and is slowly refined by an adaptation of the Wohlwill process, representing the only section of the work where time is lost. The large silver content from this Balbach-Thum system justifies the use of a relatively large Ajax electric furnace, while a smaller Ajax hearth takes care of the small gold content.

In the same works, the tin-bearing material, represented by drosses, ashes, and residues, besides anti-friction alloys, etc., is smelted in oil-fired reverberatory furnaces and a battery of 8 kettles, and following the aluminium method of removing antimony, is converted to solder. A unique method of time-saving is revealed here, as the solder runs continuously into a water-cooled, specially constructed, rim near the circumference of a circular plate mould. Thus the solder is run-in molten at one end, and comes off cold at the other end in the form of solder wire, which is continuously coiled up on drums for direct disposal to the market.

This differs from the alternative system of forcing slugs of solder through dies to come out continuously as flat solder strips, 4 in. in breadth. (While the selenium and tellurium contents are relatively small, and not a little collected in wet washing towers, this is added to what obtains from the electrolytic slimes for periodical reclamation, and could not be included as a non-stop process).[4]

Handling Impure Materials

Another of the large smelteries makes a speciality of handling impure lead materials, with rapid means of recovering the antimony and bismuth contents, while part of the lead is converted to white-lead by electrolytic methods. Prior to this, white-lead by the old Dutch process, which is still used, could be described as one of the slowest methods of production. In the electrolytic process, the lead anodes are encased in linen sacks in an anolyte of sodium acetate, and as the lead is removed as lead acetate by the action of the current, a catholyte of sodium carbonate precipitates the lead as white-lead, and returns the soda as sodium acetate. Instead of allowing the precipitated material to accumulate, it is continuously filtered, continuously dried, and passed direct to the market—probably one of the greatest improvements in time-saving on record compared with earlier methods.

In the same works, apart from both square and cylindrical-sectioned blast-furnaces, rotary reverberatory hearths are used, with magnetic vibrators for charging the lead materials. Despite the rotary nature of this oil-fired construction, there are tap-holes used at different levels to remove both slag and metal, to maintain the desired continuous system of working. An extensive battery of lead kettles makes it possible to divert the antimonial, copper, or other drosses, from one to the other to save time, as distinct from where one or two only are available, and necessitate separate working. In the Parkes process here, a stream of water impinges upon the surface of the molten lead while revolving, to maintain the desired temperature control. To speed-up handling, cold lead pigs are dug-up by a pneumatic clutch, and loaded directly on cars for removal. Test furnaces here are also of the rotary oil-fired variety.[5]

In a further works where the familiar blast furnaces of cylindrical section, reverberatories, and large kettles are engaged, one of the features of time-saving is seen in the method of handling speiss. A specially heated spout is employed to automatically skim this off, for repeated treatment, removing slags containing 20 per cent lead, and represents the speeding-up of what is otherwise a normally slow process. The concentrated speiss is then disposed of to other American smelteries on the basis of the precious metals available.[6]

In one of the smaller refineries, dealing mainly in the precious metals, the large amount of lead materials available has resulted in the use of a rectangular sectioned blast furnace with automatic lead pig moulder, and where the charging is done from the top, using a crane arrangement for elevating. The cold pig, on passing around the moulder, drops off. Much time was lost in using the earlier style of test hearths, due to these cracking and causing a spillage of the silver contents, etc. The use of water-cooled bottoms has obviated these troubles. Both electrostatic and wet collectors take care of the fume which is returned to the process for further treatment. In view of much zinc being used to handle the excessive lead accumulations, oil-fired zinc retorts of a small select type are engaged to recover the zinc from the crusts. Gases from the rare metal section are passed into lime, and this lime is conveniently utilized in a dual capacity in the furnaces.[7]

In earlier years, the smelting of zinc ores was fraught with many time losses. Today, much of the processing is done on the "chain-belt" system, i.e. in so far as keeping the different departments working on a non-stop basis is concerned. The blende and other zinc sulphide ores, as they arrive from the mines in train loads, are ground to fine powder, and taken up elevators to large Herreshoff 12-floor roasting furnaces, with various measures for attending to the dust problem.

The roasted material passes through hoppers to a belt conveyor where it is magneted to remove iron particles, and then passes up an elevator to the sintering plant. A small addition of select coal is made to assist this sintering, but not for reducing purposes, when the lot slowly but continuously passes under a burner.

The sintered mass continues its passage through a cooler, somewhat resembling in construction a rotary cement kiln, when it is ground to produce nodules, small in size, but free from dust. It should be added that the roasting system makes provision for samples to be removed for examination at different points, to maintain control within the closest tolerances, while the dust, as collected by the Cottrell precipitator, passes into hoppers and down to the conveyor belt. The rotary cooler, being cooled by water, ensures the material discharging continuously at a definite temperature.

Distillation of the zinc oxide and coal then proceeds in gas-fired batteries of retorts of modern design, and the resulting spelter is skimmed free from dross and run into flat moulds in almost unremitting sequence. Refractories required are made on the site, and for this purpose selected clay is first weathered and then ground up with flint and lime in the proportion 50 per cent clay, and 25 per cent each of flint and lime, and to which grog is added as required. The drying of the finished parts in earlier years was always a slow process to forestall the formation of cracks, and while this can only be speeded up to a limited degree, the final drying is expeditiously carried out in lengthy kilns through which car loads are successively brought to the hotter zone.[8]

Lastly, the cadmium oxide recovered from zinc fume earlier involved a number of unnecessary hold-ups. It is claimed that by an improved system of re-distilling, then briquetting the product, and again distilling under approved conditions, the cadmium is obtained free from lead, and in practically pure condition, thereby avoiding the elaborate wet extraction previously used.[9]

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Hydraulic Drive—The Modern Transmission

In 1945 there was in reasonably full production in the United Kingdom only one small fluid torque converter with a maximum capacity of around 150 h.p. Today there are in being no fewer than six major transmissions comprising fluid torque converters and couplings used individually or in conjunction with mechanical change speed gears and friction clutches. The subject of this article, condensed from a paper presented by R. H. Fett at the general meeting of the South Wales Institute of Engineers on November 21, 1957, is the Voith-North British hydraulic transmission. This is one of the very few purely hydraulic transmissions of the dynamic type which depends on the use of fluid circuits, solely for the purpose of torque multiplication and transmission of power. The purpose of the paper is to make known some of the salient characteristics appertaining to this transmission, especially in connection with the application of the transmission to locomotives both for underground and surface working

DEVELOPED over many years and used in rail service in large numbers, the Voith-North British Hydraulic Transmission is the outcome of Fottinger's original hydraulic torque converter patent. At the present time, the range of powers covered is from 100 h.p. to 1,500 h.p. through a single transmission.

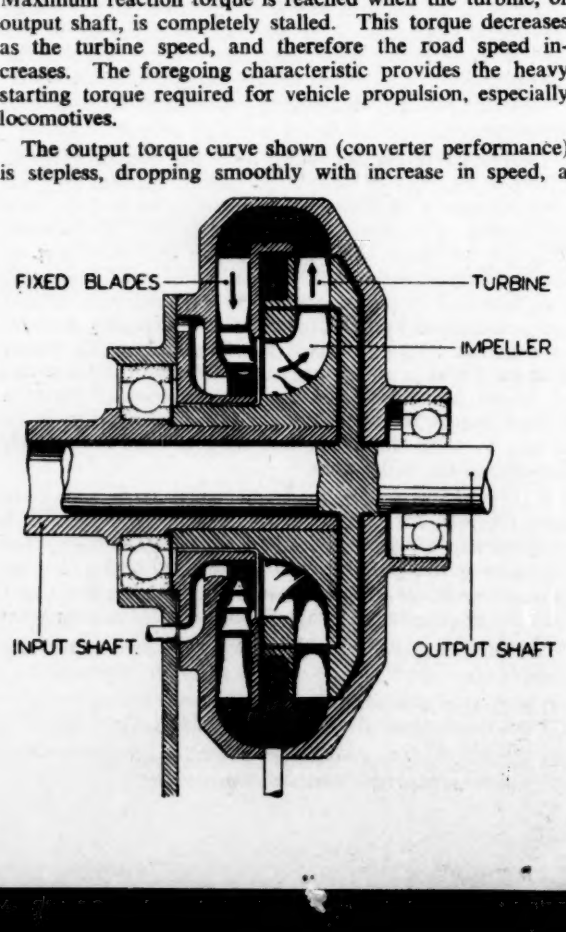
As in the conventional multi-speed gearbox, the transmission makes use of two or three fluid circuits to cover the full speed range. These transmissions are made up of a combination of torque converters and fluid couplings, or perhaps just converters in multiple. The principal difference between a fluid coupling and a torque converter is that the coupling simply transmits torque and does not multiply it.

The converter illustrated is made up of three separate members; the impeller or centrifugal pump, the turbine runner or driven member, and the fixed guide vane or reaction wheel, and in its conception can be likened to a single-stage reaction turbine.

Mechanical energy from the engine is absorbed and transmitted by the impeller, in the form of pressure and dynamic energy, to the fluid (oil). This fluid in turn, acts on the runner imparting torque to it. In other words, the horse power of the engine is converted into kinetic energy, through increased velocity of the fluid as it travels outwards and impinges on the runner blades. The fluid, as it leaves the turbine wheel, is led back to the impeller by the guide wheel, thus completing the circuit and effecting the reaction which makes torque conversion possible.

The characteristic of the fluid converter, as distinct from a mechanical converter (gearbox), is that the input torque and the speed remain constant at all road speeds, despite changes in output torque as output speeds varies. Maximum reaction torque is reached when the turbine, or output shaft, is completely stalled. This torque decreases as the turbine speed, and therefore the road speed increases. The foregoing characteristic provides the heavy starting torque required for vehicle propulsion, especially locomotives.

The output torque curve shown (converter performance) is stepless, dropping smoothly with increase in speed, a feature which is so desirable in rail traction. Whilst the engine continues to give constant torque and speed, the turbine can give out, automatically, a higher or a lower torque according to the requirements imposed by an increase or a decrease in resistance at the rails. The torque reaction is taken by the fixed blades.



The torque converter

Variations of output torque and rail speed have no influence on the engine, even should the output speed be zero. Therefore, as a locomotive slows down, the converter automatically multiplies the torque, giving an infinitely variable output torque over the full speed range.

It should be noted that the power of a torque converter increases as the cube of the speed and the fifth power of the diameter. Hence hydro-dynamic transmissions can be kept small and light in contrast to electric and other heavy mechanical transmissions.

The Fluid Coupling

The coupling is made up of two similar rotating members each having straight radial vanes. The impeller, driven by the prime mover, drives the oil on to the runner or turbine member attached to the output shaft. The h.p. of the prime mover is thus transformed into kinetic energy through the increased velocity of the fluid within the coupling as it travels outward. The kinetic energy of the fluid is released and becomes available at the output shaft because it loses rotational velocity as the fluid is forced to the inside of the chamber. Drive is therefore obtained merely by the absorption and release of kinetic energy in the fluid as it gathers and loses rotational velocity on the outward and inward flow. Up to this point the functional characteristics of converters and couplings are very similar, but beyond it the main differences appear whereby vastly different results are achieved.

With a coupling the input and output torques are always equal since the outward acceleration of the fluid by the impeller is always equal to the fluid deceleration inward by the turbine or runner. There is, however, always a slight loss in revolutions because of the necessary difference in centrifugal head between driving and driven member to enable flow to take place. This loss or slip can be as low as 2 per cent to 3 per cent, when the nominal torque is transmitted.

Typical performance of the torque converter

The Voith-North British Hydraulic Transmission is almost invariably made up of two or three fluid circuits operating in series. This enables the transmission to cover fully the speed range of the locomotive.

For general purposes in hydraulic drives it is found that an allowance of about 30 per cent of input h.p. is quite adequate to cover for losses due to heat dissipation. It should be noted that this is normally considered a peak figure and its achievement would require considerable hard work on the part of the locomotive over an appreciable time.

The heat to be dissipated in the cooler is normally given by the formula :

Dissipation in B.Th.U./hr.=

$$\frac{\text{Input h.p.} \times 33{,}000 \times 60}{778} \times \frac{30}{100}$$

Circulation of the oil is usually by the same pump employed for filling the driving circuits. Its capacity is ample for both duties, the rate of circulation depending on the temperature drop. This is commonly taken at about 32 deg. F., the circulation being easily governed by a dashpot.

Hydraulic Fluids

Selection of oil for use in the converter is important because of several reasons. The following conditions should be observed to the greatest possible extent : Viscosity should be low at working temperatures; specific gravity should be as high as possible; the pour point should be low; lubricating properties should be good; the flash point should be high; the oil should be of a non-corrosive nature; availability is important; it should not foam readily.

Low viscosity is desirable as it reduces the losses from friction and turbulence, thereby assisting in the maintenance of efficiency.

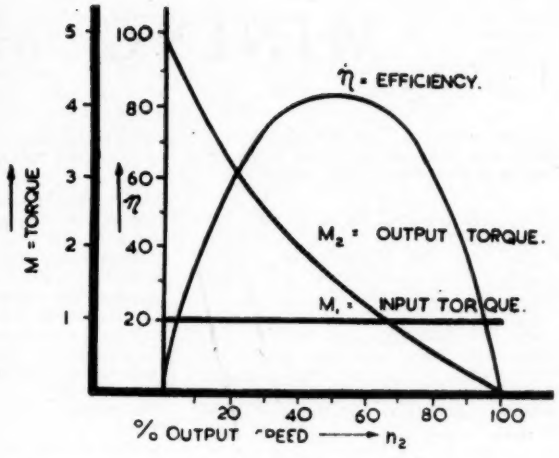
The viscosity temperature curve should also be as flat as possible in order to obtain consistent results within the upper and lower temperatures limit at which the transmission may work. The oil should at—50 deg. C. (—58 deg. F.) possess fluid characteristics and show a maximum viscosity of 10 deg. E. (307 in. Redwood).

Oils which have been used successfully to date possess the following viscosity characteristics :

At 20 deg. C. (68 deg. F.) ... 4 deg.— 5 deg. E. (153 in. R.)
At 50 deg. C. (122 deg. F.) ...1. 8 deg.— 2 deg. E. (61.4 in. R.)
At 100 deg. C. (212 deg. F.) ...1.15 deg.—1.2 deg. E. (36.84 in. R.)

Perhaps the most important factor concerning any oil employed in hydraulic torque converters is its resistance to foaming. Ageing of the oil is important and the fluid should retain its properties for long periods. At high temperatures it should be resistant to oxidation if mixed with air. Insoluble deposits should not form on metal parts. There should be no change in properties nor precipitation of constituents within the range of working conditions. The fluid must not deteriorate under the influence of contact with various metals, including iron, steel, aluminium and bronze. The flash point must be high, not less than 160 deg. C. (320 deg. F.).

The claims put forward in favour of this transmission are well founded on fact and experience in service over many years. In the main they consist of the following :—



(a) Provision of infinitely variable torque ratio by the converter. Efficiency similar to that of electric traction in the converter, but exceeds this when employing fluid coupling circuits in the transmission.
(b) Initial starting torque is high, reaching 10/12 times multiplication with certain transmissions.
(c) The characteristics of the converter result in the automatic application of the most effective torque ratio at any instant to meet existing conditions of torque, load and track.
(d) Consequent upon the absence of relative movement or displacement of parts as in mechanical gears, there is a real reduction in maintenance because of the absence of wear and tear associated with the operation of moving parts.
(e) Because of the balance between torque and track load it is possible to apply force without movement. It is possible to avoid a brake application to hold a train temporarily on an up grade.
(f) This fineness of balance is extremely useful where it is necessary to inch trains at very low speeds, such as over weighbridges or tipplers.
(g) Being automatic the transmission takes complete control of the vehicle in respect of acceleration and deceleration.
(h) The automatic balance of power and load results in a sense of complete confidence in the operator. The element of human judgment as to when he should change gear and what gear to use for a given set of conditions is eliminated.
(i) There is an absence of rigid or mechanical connection between prime mover and driven parts.
(j) Whenever it is found necessary to multiply torque for speed and load requirements which are constantly changing there will be found economy and efficient operation in the application of the Voith converter. The diesel engine works at constant speed and is not subjected to wide fluctuations of speed and load. Consequently the overall performance of engines and allied equipment is reflected in reduced maintenance and prolonged availability.
(k) The light weight of the equipment offers great scope to the designer and operator.

The transmission is a piece of precision machinery. As such it requires the attention and class of manufacturing workmanship applicable to first-class geared transmissions.

Voith transmissions in service (December 31, 1956,) exceed an aggregate of 2,000,000 h.p. embodied in approximatelv 5,400 transmissions.

MINING MISCELLANY

Poland exported 7,217,000 tons of coal during the first half of 1957 compared with 19,187,000 tons in all 1956.

★

Plans are reported to be in hand for the exploitation of a new magnesite deposit near the Russo-Czech border, estimated to contain some 100,000,000 tons of high-grade material.

★

For the first time in twelve years Poland has been able to reduce the planned cost per ton of coal extracted. As compared with the plan, this cost will be lower by between 2.50 and 2.80 zlotys per ton.

★

Coal in veins up to 4 ft. thick has been found at a depth of 1,500 ft. near Moses Wells, in the Sinai Peninsula, 35 miles south of Suez. The deposit is estimated to be about 1,000,000 tons. It is further claimed that additional prospecting has shown the existence of coal in the Western Desert.

★

Mr. V. R. Nicholas, of Port Elizabeth, has signed a contract transferring to a large mining group most of his rights to the titaniferous deposits near East London, in South Africa. The agreement provides that work must start before July 1.

★

Dr. H. J. Bhabha, chairman of the Atomic Energy Commission of India, has announced that steps are now being taken to produce in India all the materials required in the development of power from atomic energy. The programme includes a heavy-water plant at Nangal, a uranium plant, and a pilot plant to turn out beryllium oxide.

★

The discovery of another large iron-ore body in the Ungava Peninsula of Quebec has been announced by Mr. P. H. D'Aragon, president of Quebec Explorers Corporation. The company holds an exploration permit covering approximately 100 sq. miles in the Lake Armand area. Planex Associates, of Montreal, are to carry out further study and planning of the project.

★

William H. Mueller and Co., of Rotterdam, has entered into an agreement with an American banking group and the National Blast Furnaces Enterprise of Chile, under which it will sell the Algarrobo iron ore mines in Chile to a new Chilean company to be controlled by National Blast Furnaces. Operation of these mines will be financed entirely by the American bankers. Production is expected to start early in 1960.

★

The largest deposit of phosphate rock in the United States was inspected recently by Governor George D. Clyde, of Utah. It is anticipated that this still undeveloped deposit, which is situated at Vernal, Utah, may become a major source of phosphorus within the next few years. San Francisco Chemical Co., jointly owned by Stauffer Chemical Co. and the Mountain Copper Co., Ltd., hold exclusive rights to the huge deposit, which covers some 15,000 acres. Indicated phosphate rock reserves, averaging 21 per cent P_2O_5, approximate 700,000,000 tons. San Francisco Chemical has been proving the deposit for several years by means of extensive core drilling and tunnelling.

★

The copper ores of the Urals contain appreciable amounts of lead, cadmium, selenium, rhenium, indium, tellurium and other metals. An article in the *Industrial and Economic Gazette* points out that none of the local smelters or enrichment plants makes any provision for the recovery of these metals; for example, the Krasnuralsk copper smelter each year fails to recover 400 tons of copper, 1,200 tons of zinc, 1,500 tons of lead, and "substantial quantities" of cadmium, selenium and tellurium. The journal demands that smelting and enrichment plants be equipped with efficient filtering devices and that slags and flue dusts be processed by "modern technological methods".

★

Lead deposits found in the area of Boquira, in Bahia State, are believed to be the richest so far discovered in Brazil. Experts of the United States Geological Survey and Brazilian Government representatives have visited the site to determine the extent of the finds and whether they are workable.

★

It has been announced that the new copper refinery in Israel, at Timna, near Eilat, will start production of metal at the beginning of February, 1958. The plant will have an annual capacity of 7,000 tons. Local ore deposits are estimated to contain some 3,500,000 tons of material.

★

France may help to develop the copper mines at Bor if negotiations between a Yugoslav delegation and the French company, Compadec (Compagnie pour l'Etude et le Développement des Echanges Commerciaux) for French credit to finance the venture are successful. Should agreement be reached, the contracts would be awarded to French firms specializing in mining equipment.

★

Péchiney, the French aluminium and chemical producer, has announced the conclusion of an agreement with the American Grace Corporation for the construction in Puerto Rico of a plant to produce high-purity silicon.

★

The United States Steel Corporation has reached the design stage in a plan to build a railway line to serve its iron ore mining project in Quebec. Quebec Cartier Mining Co., a subsidiary of the steel company's Oliver Mining Corporation div.sion, plans to form the railway company in the Bush country around Mount Wright, twenty-five miles north of Shelter Bay, on the St. Lawrence River. There, Quebec Cartier has staked out and partially test-drilled deposits of 25 to 30 per cent ore estimated to comprise a holding of at least 700,000,000 tons. It is understood that the company plans to build a pilot plant for tests of a project to improve the Mount Wright region ore and hopes to bring the entire project into production by 1962.

★

The Store Norske Spitzbergen Kulkompani A/S is spending an estimated 25,000,000 crowns to open a new coal mine—Mine No. 5—in Spitzbergen. Production from the new mine is planned to start in the first half of 1959.

★

Rich mineral ore deposits have been found in Shensi Province, North-west China, according to Peiping radio. It is claimed that geological surveys, uncovering fifty-four different kinds of ore, have confirmed that Shensi Province has the richest copper reserves in the country. Discoveries also include lead, zinc, molybdenum, aluminium and gypsum. The broadcast added that coal deposits, including anthracite, coking and bituminous coal, amounted to over 400,000,000,000 tons, much of it close to the surface.

★

The French company Ugine is considering the extraction of chrome ore from deposits in the neighbourhood of Tamatave, Madagascar. Prospects are considered favourable in view of the proximity of the port. An annual output of some 100,000 tonnes of chrome/iron ore could be reached. At the same time, the company is understood to be assessing the possibilities of an annual production of 3,000 to 4,000 tonnes of nickel from deposits in Madagascar. Ferronickel would be produced from the local ores and sent to France for further processing. A hydroelectric plant would need to be constructed.

★

An extensive coalfield has been found in the Ross Dependency in Antarctica. The discovery was reported by two geologists with the New Zealand Antarctic expedition, Mr. Bernie Gunn and Mr. Guyon Warren. The two men have been working in the region between McKay and Fry Glaciers since October 4.

★

Tandem Mines, Ltd., of Toronto, have announced a new iron ore smelting process which, the company says, may turn into commercial ore large deposits of iron ore now considered valueless because of their titanium content. The process is the invention of Dr. Roy A. Halverson, of Detroit, U.S., and has been patented in the United States. Patents are reported to be pending in Canada, the United Kingdom and other countries.

★

The President of the U.K. Board of Trade, Sir David Eccles, has declined to accede to a Parliamentary request that he should take steps to prevent the speculative buying of raw materials in order to bring about the lowest possible prices for them.

★

About £100,000 has been spent on borings in search of coal in Northern Ireland since April, 1952. The Minister of Commerce, Lord Glentoran, stated in the House of Commons that of this sum £16,000 had been for shallow borings, chiefly in the investigation of the areas in Tyrone and North Antrim, where small quantities of coal existed relatively near the surface. It was intended in the coming year to investigate further a part of those deposits in Tyrone, which appeared to have posssibilities of limited development. The bulk of the expenditure—about £83,000—has been for deep borings to explore the general geology at depth, with the particlar object of locating the principal coalfield, which it is

believed might have been formed at one time in connection with the known deposits and deposits in Great Britain.

★

Steps are being taken by the Indian Government to ascertain whether the deposits of iron ore and chromite in Salem district, Madras State, are sufficiently large to admit of large-scale exploitation.

★

The Thai Mines Department has asked for Cabinet permission to expand tin smelting in the country to meet domestic needs. There appears, however, to be no recorded production of tin metal in Thailand since 1952.

★

On December 4 (Miners' Day), the first sulphur mine in the history of Poland was commissioned in Piaseczno, near Tarnobrzeg, Rzeszow voivodship. In order to reach the deposits, it was necessary to remove 400,000 cu. yds. of overburden and drain away over 1,430,000,000 gallons of water. Next year the Piaseczno mine will yield 50,000 tons of ore and in 1960 about 500,000 tons.

★

The Turkish Ministry for Industry has announced that the country's copper and chrome ore production is to be raised. New plant at Murgul is nearing completion and a large increase in output at this mine is anticipated as soon as it comes into operation. Chrome production in 1956 was 272,440 tonnes and in the first ten months of the current year 236,541 tonnes. Exports in 1956 were 228,215 tonnes against 72,286 tonnes in 1954.

★

An airborne geophysical survey of the Tennant Creek mineral field in the Northern Territory was recently completed by the Bureau of Mineral Resources, Australia. An area of over 2,000 sq. miles was flown by the Bureau's D.C.3 survey aircraft fitted with magnetometer, scintillograph, and radio positioning equipment. The primary aim was the detection of the gold and copper mineralization which commonly occurs in association with bodies of quartz-haematite-magnetite. The first of the maps, covering an area of 500 sq. miles around the Tennant Creek township, is now available. It can be obtained from the offices of the Bureau of Mineral Resources in Melbourne, Canberra and Darwin, the Mines Branch in Sydney, the Atomic Energy Commission in Sydney, and at the Mining Registrar's office in Alice Springs and Tennant Creek.

★

Successful transition of a century-old iron ore mine from an open development to a deep underground operation is described in a publication issued by the Bureau of Mines, United States Department of the Interior, Washington, D.C., "Information Circular 7800, Mining and Milling Methods and Costs, Benson Ore Co., Iron Mountain Pit, Iron Ore Mine, St. Francois County, Mo." It is obtainable from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

★

The American Institute of Mining, Metallurgical and Petroleum Engineers has published the fourth volume of its series on "Nuclear Metallurgy". It contains all the papers of a symposium on uranium and uranium dioxide conducted by the Institute of Metals Division of the Metallurgical Society of A.I.M.E. at the A.I.M.E. annual autumn meeting in Chicago, November 6, 1957. This volume contains sixteen papers relating to the metallurgy and fabrication of the nuclear metals. It is obtainable from the A.I.M.E. headquarters at 29 West 39th Street, New York 18, N.Y., at $5 for A.I.M.E. members and $7 for non-members. Volumes I, II and III of "Nuclear Metallurgy" are available at $2.50 for A.I.M.E. members and $3.75 for non-members.

PERSONAL

Mr. H. F. Oppenheimer has been appointed a director of the General Mining and Finance Corporation, Ltd., in place of the late Sir Ernest Oppenheimer. He has also been elected to the boards of the Central Mining and Investment Corporation, Ltd., and Central Mining Finance, Ltd.

★

Mr. A. V. Conrad and Mr. M. W. Richards, who are managers of the Corporation, and Mr. H. L. Monro, who is the senior consulting engineer, have been appointed directors of Union Corporation, Ltd.

★

The death has occurred of Mr. H. C. Gant, who has been a director of Cynamid of Great Britain, Ltd., for the past thirty years.

★

The International Nickel Co. of Canada was awarded the silver Oscar for the best 1956 annual report by a Canadian company among more than 500 judged in an annual competition sponsored by *Financial World*, an American investment and business weekly.

★

Mr. W. J. Lloyd has been appointed as general manager of Short and Mason, Ltd.

★

Mr. D. A. Etheredge has been appointed to the board of Chambishi Mines Ltd. The managing director of Selection Trust Ltd., London, is Mr. T. H. Bradford and not Mr. Etheredge as stated in last week's issue.

COMPANY EVENTS

Production has started in Britain of Lagonda tube-cleaning equipment, including all types of cutter heads and boring tools. This is the outcome of recent negotiations between the Elliott Co., a division of the Carrier Corporation, of Springfield, Ohio, U.S.A., manufacturers of the Lagonda equipment, and the Consolidated Pneumatic Tool Co., Ltd., of 232 Dawes Road, London, S.W.6. An agreement between the two companies provides for the manufacture in Britain of every type of Lagonda tube cleaner to the exact specification of the United States models, plus the full variety of Lagonda cutter heads and equipment. Consolidated Pneumatic will also provide complete sales-and-service facilities for Lagonda equipment throughout the Sterling Area. Initial supplies of the British-made Lagonda equipment are expected to be available over the coming months.

★

Handy and Harman are building a new plant at El Monte, California, about 15 miles east of Los Angeles. Covering 23,000 sq. ft., it will have twice the capacity of the present plant in Los Angeles, which it is to replace. The new unit will manufacture the company's complete line of products, including silver brazing alloys and fluxes, sterling silver and carat gold sheet and wire, silver anodes and sterling and fine silver grain. The laboratory will be equipped for precision analysis and weighing of gold, silver, platinum, and other metals, and the refinery for efficiently reclaiming precious metals from scrap and waste.

★

Work has started on the first stage of Solartron's £1,250,000 five-year expansion plan for increasing their production capacity at Tower Hill, Farnborough, Hants. The first section of the final building of 350,000 sq. ft. on the fifteen-acre site will be ready for occupation by August, 1958, and will have an area of 50,000 sq. ft. It will house comprehensive manufacturing facilities in the fields of electronics, electromechanics, hydraulics, pneumatic and precision mechanical engineering.

★

A year ago the North British Rubber Co., Ltd., announced that it would embark on a £3,000 000 modernization plan, part of which involved the demolition of approximately one-third of its factory area in Edinburgh for the erection of a new 145,000 sq. ft. one-storey factory building. This will be used for a range of hose including giant hose, which is today an important export item. Demolition is now almost complete and the company has been able to start on the foundations of the new factory building. The foundation ceremony has been performed by the Lord Provost of Edinburgh. At the company's Heathall plant at Dumfries, a major expansion is also under way, in this case for rubber conveyor belting and for the National Coal Board P.V.C. fire-resistant belting.

CONFERENCES AND EXHIBITIONS

The Third Production Exhibition and Conference will be held in the Grand Hall, Olympia, London, from May 12 to 21, 1958.

★

The annual dinner of the South Wales Institute of Engineers will be held at the Park Hotel, Cardiff, on January 16, 1958.

★

For the first time in Western Canada an international trade fair of major importance has been planned. It will take place at Exhibition Park, Vancouver, British Columbia, from May 1 to 10, 1958. This event coincides with the British Columbia Centennial. British Columbia offers a continually expanding market which imports over $500,000,000 worth of goods annually from eighty-three countries. Details available from Mr. T. L. Sturgess, Deputy Minister, British Columbia International Trade Fair, Department of Industrial Development, Trade and Commerce, Victoria, B.C., Canada, or from the Agent-General for British Columbia, 1 Regent Street, London, S.W.1.

★

The Poznan International Trade Fair will be held from June 8 to 22, 1958. There will again be British sections under cover and in the open. Application for space should be made direct to the Poznan International Fair, 14 Glowgowska St., Poznan, Poland. Application forms are obtainable from the Export Publicity and Fairs Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1. The final date for receiving applications in Poznan is February 15, 1958. Telephone inquiries should be addressed to the Export Publicity and Fairs Branch, Chancery 4411, extension 6, quoting ref. E and F 674/57.

Technical Briefs

Reticular Aluminium-Tin In Bearings

The bringing into production of a new type of bearing alloy is announced jointly by the Tin Research Institute and the Glacier Metal Co., who have been working together for some years on its practical development.

The new bearing alloy contains about 20 per cent of tin, the remainder being aluminium hardened with from 1 per cent to 3 per cent of copper. The tin constituent has a structure which is reticular within the continuous aluminium matrix, that is to say, the tin has a structure which is itself continuous without disturbing the continuity of the aluminium. Should metal-to-metal contact occur between a shaft and a bearing with this reticular structure there is an immediate supply of tin available at the surface to provide a thin soft layer of tin over the aluminium and thus inhibit surface breakdown.

The new alloy, therefore, combines the strength of a continuous aluminium phase with the tin-availability of a comparatively heavy and continuous tin structure. When supplied in the form of steel-backed bearings, it provides a better balance between the opposing demands of high fatigue strength and low rates of wear than any other known plain bearing. Furthermore, unlike copper-lead bearings, it needs no lead-based overlay plating to keep shaft wear in check.

A significant feature for large diesel engine applications is that since the alloy contains no free copper there is no danger of copper penetration of steel journals.

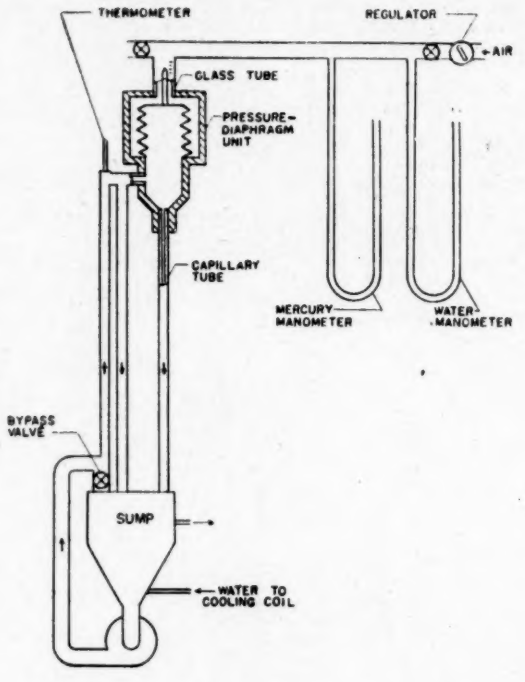
Reticular aluminium-tin bearings can, of course, be supplied pre-finished, but since they have no overlay plating they can equally well be supplied semi-finished for boring in place, as is so often necessary or desirable in the case of large stationary diesel engines. These new bearings have already proved themselves and some 500,000 bearings made from the new material are already in actual use.

PAPER BY-PRODUCT FOR HAULAGE ROADS

Lignin sulphonate, a by-product of paper mills, can be used satisfactorily at many mining operations to control road dust and to improve road surfaces. A report on studies made at open-pit mines in the south-west U.S. says that when proper aggregates are used in surfacing roads and when lignin sulphonate is applied correctly, dust is greatly reduced and surfaces become more durable.

One of several materials available for improving haulage roads, lignin sulphonate has been used many years on some public thoroughfares in the United States and first was tested in Sweden more than 60 years ago.

A recent publication describing the use of lignin sulphonate at certain open-pit mines in the south-west United States advises that companies intending applying the material on roads above ore that is to be mined should first conduct tests to determine whether contamination of the ore will result.



A pressure - diaphragm viscometer developed in the recent U.S. Bureau of Mines investigation, like the DeVaney - Shelton viscometer, is a capillary-type instrument. With this apparatus, however, the rate of flow through the capillary tube can be varied

VISCOSITY IN COAL CLEANING

The widespread adoption during the past decade of the dense-medium process for cleaning coal increases the need for technological studies of the process. Such studies provide information that will insure maximum usefulness of this process in its present form and may well lead to substantial improvements in design and operation.

The U.S. Bureau of Mines has published the results of cleaning trials on a wide variety of coals in two dense-medium pilot plants and has reported the recovery of coal from waste by dense-medium treatment. A recent report deals with the viscosity of magnetite dense medium, an important subject about which virtually nothing has been published. Specifically, the report concerns methods for measuring viscosity, the influence of various medium contaminants on viscosity, the effect of viscosity on cleaning results, and the influence of viscosity on consumption of medium.

Cleaning trials on four coals of varied density composition in a pilot plant, using mediums of different viscosities, showed a steady reduction in cleaning efficiency with increasing viscosity in every instance. However, the behaviour of each coal in a viscous medium was distinctly individual. With one, an increase of only 1 centipoise in viscosity caused a reduction in recovery efficiency of 7.7 per cent, whereas the same increase in viscosity with another reduced recovery efficiency only 2.7 per cent. A new type of viscometer was built to furnish more complete information on the rheology of dense medium.

Testing of mediums contaminated with coal and various types of clay demonstrated that the viscosity produced by a contaminant is related to its size. Bentonitic clays containing principally sodium montmorillonite, which disperse to extremely fine particles, increase viscosity the most. Kaolinitic clays do not break down to such fine size, and they influence viscosity much less. Identification of the principal minerals in a clay by routine differential thermal analysis enables prediction of approximately how much it will affect viscosity.

NEW USES FOR LEAD

Two entirely new uses of lead, the rechargeable lead dry cell "mighty midget" battery designed to power miniature electronic circuits of the jet and missile age and the application of leaded ceramic colours on one face of glass building blocks, are described in a recent issue of *Lead*, quarterly publication of the Lead Industries Association.

The "mighty midget" lead dry cell battery was developed by the Naval Ordnance Laboratory and is no larger than a medium coin and is $\frac{1}{8}$ in. thick. It delivers 9/10 of a volt with a rated capacity of $1\frac{1}{2}$ ampere hours and in addition to ordnance applications is readily adaptable for use in transistor circuits of hearing aids, air navigation systems and portable radios. The new battery has an indefinite shelf life in the uncharged state and in use its capacity is not affected by repeated recharging over long periods of time.

The other new application is the use of leaded ceramic colours applied to one face of conventional glass building block, developed by Pittsburgh Corning Corp.

Metals and Minerals

Uncertain Outlook for Manganese Ore

Both in London and New York the tone of the manganese ore shipment market is at present far from reassuring. The overall volume of business is unimpressive, and there are few indications to suggest that improved trading conditions will develop in the foreseeable future. In the U.S. the downward trend of prices is causing buyers to hold off, while the uncertain steel situation also prompts caution.

It is understood that the U.K. has now virtually covered her 1958 requirements through her main suppliers, which include India, the U.S.S.R. and Ghana. It is believed, however, that the U.S.S.R. contracts have not yet been completely settled. The total quantity which the U.K. will buy in 1958 is expected to be less than was bought for 1957, due to the very satisfactory level of stocks—reported to be the best for many years. During January - October this year the U.K. imported some 386,820 tons, which compares with 444,044 tons in all 1956.

The latest official statistics from India indicate that exports of manganese ore during the period January - June, 1957, amounted to 840,000 tons, valued at Rs.159,000,000. During the whole of 1956, 1,458,000 tons of manganese ore with a total value of Rs.231,100,000 were exported. In the first six months of this year the U.S. imported 352,000 tons of manganese ore from India, as against 638,000 tons in all 1956. India's other principal customers are France, Japan, the Netherlands, the U.K., Belgium, Italy, West Germany and East Germany.

★

South African Manganese have been advised by the South African Railways Administration that no improvement in the supply of trucks for the manganese industry can be expected during 1958, states the chairman of the company, Mr. R. Dyason. He adds that railings for export during this year and the indicated truck supply were the lowest since 1952.

★

Good progress has been made with prospecting operations for manganese ore in the Ivory Coast, carried out by the French mining concern, Cie des Minerais de Fer Magnetique de Mokta-el-Hadid. It is regarded as probable that a manganese deposit of medium size will soon be mapped out. The company is already active in mining the manganese deposit at Franceville (Gaboon) through Comilog, in which U.S. Steel has a 49 per cent interest.

★

Of the 31,126 l.tons of ferro-manganese still to be furnished to the U.S. Government under barter arrangements, some 18,500 l.tons is still being manufactured outside the U.S. and about 12,500 tons in the U.S.

GREEK ALUMINIUM PROJECTS

The Greek Premier, Mr. Constantine Karamanlis, has announced plans for the establishment of an aluminium industry based on the processing of Greek bauxite. The whole project is estimated to cost $100,000,000 to $120,000,000. The aluminium industry is linked with a soda ash industry, the formation of which will be sought at the same time.

Two United States companies, Reynolds Metals and Kaiser Aluminum, have both shown interest in Greece's aluminium plans. On the basis of talks with the Greek Minister without Portfolio, Mr. Kasimatis, Reynolds has submitted a questionnaire on prices of Greek bauxite and local electricity costs. Kaiser is reported to be considering the dispatch of a mission to examine the problem on the spot, after having submitted a similar questionnaire. It is understood that West Germany has also displayed interest in Greek possibilities. Greece now exports about 500,000 tonnes of bauxite annually.

TITANIUM'S SETBACK

For the sixth successive month further declines were registered in the United States outputs of titanium ingot and mill products. Production of titanium ingot totalled 304 s.tons in September, compared with 515 s.tons in August. It is believed that sponge operations are probably down to about 20 per cent of capacity. The production of titanium mill products in September totalled only 267 s.tons, while shipments of titanium products in the same month were down further—also to 267 s.tons—which is less than half the total of 577 s.tons shipped in the peak month of January.

It has been reported that reduced demand for titanium ore will compel curtailment of operations at two ilmenite mines and processing units near Starke, Florida, owned by the Dupont Co. and operated by the Humphreys Gold Corporation. The two facilities, which at present employ some 250 workers, will lay off about fifty or sixty in January and February.

Nevertheless, it can scarcely be doubted that titanium and its alloys have an encouraging future, possibly in missiles, but also in civilian fields like the chemical industry. Technological progress may be expected to improve titanium's competitive position by leading to further cost reductions. For instance, the Curtiss-Wright Corporation has just announced that new production manufacturing methods developed for the extrusion of titanium jet-engine parts directly from cast ingots have reduced costs of the parts by as much as 40 per cent. In addition to lowering manufacturing costs, use of the new methods is reported to have resulted in greater utilization of raw material—the ratio of finished part weight to raw material weight. It is believed that the Curtiss-Wright process will have a wide application in non-defence as well as defence uses.

In Britain, extensions to the Hylite range of titanium alloys manufactured by William Jessop and Sons have been reported.

★

The Swedish Iron and Steel Works, Avesta Jernverk, is reported to be expanding the commercial production of titanium metal, mainly for the chemical industry. The only other Swedish company working with titanium is Bofors, who machine titanium bars, imported from the United Kingdom.

$1,500,000 ZIRCONIUM ORDER

A U.S. company, Firth Sterling, Inc., has been awarded a $1,500,000 contract by Westinghouse Electric Corporation for the melting of zirconium ingots from sponge and conversion into finished mill products. This is the first integrated contract given in the U.S. to a single company to carry out both the melting as well as the rolling of zirconium alloys. Coinciding with the news that another U.S. producer, Carborundum Co., is reducing by $5 a lb. the price of its reactor grade zirconium sponge, it may be regarded as a further milestone in the commercial development of zirconium.

Carborundum's price for reactor grade sponge has been cut from $12.50 a lb. to $7.50. This reduction has been made possible by larger volume and improved plant efficiency. In September this year a plant was brought " on stream " by this company which will produce about 600 s.tons annually of zirconium sponge.

National Distillers and Chemical Corp., another important producer of the metal, has been charging about $7.50 a lb. for the metal. Both companies are also supplying the Atomic Energy Commission with zirconium sponge under government contracts. National Distillers' present price under these agreements is $4.54 a lb., while Carborundum's is believed to be slightly over $8.

Firth Sterling, one of the largest present melters of zirconium, will double its melting capacity by the end of the current year.

More than thirty processors and manufacturers of zirconium are listed in the latest study of this rapidly developing industry by the Bureau of Mines, United States Department of the Interior.

99 LB. OF ZINC PER CAR

According to the New Jersey Zinc Co., the total weight of zinc die castings used in the production of the Edsel ranges from 86 to 99 lb. per car. Since the Edsel is the first new make of motor car produced by a major U.S. manufacturer in 19 years, it is of special significance that such a wide range of zinc die castings is used in its design and construction.

Owing to the Christmas holidays our regular market features do not appear this week. They will be resumed in our next issue.

Mining Finance

What O.T.C. Means to Lake View and Star

Lake View and Star, the big Westralian gold producer, qualified as an overseas trade corporation on April 6, 1957, Sir Joseph Ball stated at the annual meeting held last week.

As an O.T.C. the company, in future, will pay no profits tax either on distributed or undistributed mining profits and will only be required to pay U.K. income tax of an amount equal to that which has to be deducted from the dividend payments. On non-mining profits—which form a relatively small portion of the company's gross income—income tax and profits tax will continue to be charged as formerly.

The taxation benefits arising from its newly-acquired O.T.C. status during the year cut the company's U.K. tax liabilities back to £115,000 compared with £235,500 in the previous year and also has enabled the provision made for income tax for 1957-8 on mining profits, amounting to £158,000, to be written back to the credit of the profit and loss appropriation account. As a result of these reliefs the company raised the total dividend for the year to 2s. 6d. per share, against 1s. 9d. in the preceding year.

Moreover, on the basis of current profits the company feels reasonably sanguine of being able to maintain the present distribution of 2s. 6d. per annum. Whether or not it will be possible to improve upon this distribution must depend largely, Sir Joseph said, upon what, if any, additional capital expenditure may be found necessary.

While all categories of shareholders wherever resident and whether they be individuals or corporate bodies will benefit in varying degrees, shareholders resident in Australia—where no tax whatsoever is imposed on profits from gold mining—will in future be in a very enviable position.

Because O.T.C. status will confer on the company substantially the same tax benefits as would have been available from emigration, the application for transfer of domicile submitted to the U.K. Treasury at the beginning of this year has been withdrawn.

TIN COMPANY QUOTA ESTIMATES

Since the new quota restrictions on tin output were announced on December 6, the chairmen of five major tin companies —Ayer Hitam, Kepong, Malayan, S. Malayan and Pahang—have given their views on the quota likely to be applied to their companies. It must be emphasized that these are purely estimates by the producers concerned, and are, therefore, subject to variation when the official figures become available.

Mr. G. W. Simms, of Ayer Hitam, is of the opinion that his company's allocation will be approximately 672 tons per annum, implying a cut of about 33 per cent on the base period, although a cutback of 38 per cent is possible. Mr. E. V. Pearce, of Malayan and Southern Malayan, however, is rather more optimistic, assuming a reduction of around 28 per cent—a quota of 377 tons per quarter—for Malayan, and 18 per cent—586 tons per quarter—for Southern Malayan.

Mr. J. H. Rich, of Kepong Tin Dredging, also takes 33 per cent as his basis, and estimates an annual quota of 212 tons. Mr. G. H. Fairmaid, the chairman of Pahang Consolidated, puts his estimate at 135 tons per month. This appears to be based on the overall reduction figure for European mines of 27½ per cent. However, Pahang may turn out to be a special case by virtue of the fact that it is a deep lode mine, with the attendant technical difficulties of abandoning a section of a mine with a view to re-entry at some future date.

The obvious conclusion to be drawn from the above estimates is that the sooner the official quotas can be published the better. The present confusion and uncertainty is to no one's advantage, least of all the International Tin Council's.

PROGRESS OF G.M.K.

Progress of Gold Mines of Kalgoorlie, Western Australia, is of continuing interest, writes our Australian correspondent. This company absorbed the Paringa, Boulder Perseverance, South Kalgurli Consolidated and Enterprise mines, and is welding these mines into an economical operating unit. In addition, the leases of New Coolgardie Gold Mines were taken over.

Extensive work is being done in the rearrangement of transport in the Kalgoorlie group, the work on the east side being near completion, but is further off on the west side of the group. Development has shown good results. During the year 26,549 ft. of development were done, and 32 per cent was in ore averaging 9.5 dwt. over 64 in. Since the end of the year progress has been 10,232 ft., of which 29 per cent was in ore worth 11.2 dwt. over 67 in. Ore reserves are estimated at 1,467,000 tons, with an average value of 5.8 dwt.

Very satisfactory results are reported to have been obtained in the Perseverance, South Kalgurli and Hainault leases. Exploration is to be carried out in the calc schist zone between the Enterprise and Perseverance shafts, which are 980 ft. apart. Initial development will be at No. 23 level towards lodes indicated by diamond drilling. An interesting phase is the recovery of sulphur dioxide from auriferous concentrates. Cuming Smith and Mount Lyell Farmers' Fertilisers have established a roasting plant at Fremantle, where pyritic gold concentrates will be roasted for the recovery of sulphur dioxide for the manufacture of sulphuric acid for the superphosphate works. Gold will be recovered in a cyanide plant erected to treat the calcines. The plant is being expanded to take the whole output of concentrates from the mine.

It is noteworthy that the results of geological investigation are being reflected in development, thus adding to the outstanding successes of such work in the Great Boulder and Lake View and Star Mines. At Coolgardie, exploration in Bayley's Mine has shown short but rich shoots by driving and diamond drilling, the exposures averaging 21.9 dwt., 17.1 dwt., 43.7 dwt. and 23.7 dwt. over widths from 61 in. to 90 in.

The year's developments in the whole property point to a very satisfactory future for Gold Mines of Kalgoorlie.

KAFFIR DIVIDEND SEASON CLOSES

Remaining declarations in the Rand half-yearly dividend season are summarized below. Among Central Mining properties, Durban Deep maintained the June rate of 1s. 6d. to raise the year's total to 3s. against last year's 2s. 9d., but Blyvoor was only able to maintain 1s. and Modder East was forced to reduce its payment from 1s. to 9d., compared with a total distribution of 2s. in 1956. Highspot of the Anglo-Vaal Group was the further advance of Hartebeestfontein to 3s., making 5s. for the year against 2s. 6d., although there was disappointment in some quarters at the amount of the rise. All mines of the Union Corporation group, save Marievale and E. Geduld, showed some reduction viewed on an annual basis, the largest drop being in Geduld Prop., whose payment depends as much on declarations by other mines in the group as on results from its own dying property.

Mine	*June* 1956	*Dec.* 1956	*June* 1957	*Dec.* 1957
Central Mining	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Blyvoor	1 0	1 0	1 0	1 0
City Dp.	—	6	6	6
C.M.R.	2 0	1 6	1 3	1 3
Crown	3 0	2 0	1 0	1 3
Durban	1 3	1 6	1 6	1 6
E.R.P.M.	2 0	2 6	2 3	2 3
Modd. E.	1 0	1 0	1 0	9
Anglo-Transvaal				
Harties	1 0	1 6	2 6	3 0
Rand L.	3	1½	1½	3
V'ge M.R.	1½	1	1	1
Union Corpn.				
E. Ged.	2 0	2 3	2 0	2 3
Ged. Pr.	6 9	7 6	6 3	6 6
Groot.	1 1	1 4	1 1	1 3
Marie	1 0	1 3	1 0	1 3

ANGLO-BURMA TIN'S JOINT VENTURE

Anglo-Burma Tin Company, following the cessation of its mining operations on the transference of its assets, mining stores, etc., to Anglo-Burma Tin Company (1956), Ltd., a private company registered in Burma in which the company under review holds 49 per cent of the issued capital (the Burmese Government own the remainder), is virtually a holding company.

The point at issue is whether it should continue its present rôle and follow its

interest in the joint venture, or whether it should commence other activities, or, indeed, whether the ultimate intention should be to wind up and distribute the assets to shareholders. While the company recognizes the need to finalize this matter, it is prevented from doing so because of its uncertain position with regard to its position in Burma and with the Inland Revenue; the fact that its holding in the joint venture company is in unquoted shares which must be held firm and in one block; and finally, the difficulty arising out of the joint venture company being under obligation to continue the tribute operations the company had previously carried out on its behalf.

During the year ended September 30, 1956, operations of the joint venture company resulted in a total production of 97 tons of tin concentrates and a loss of £28,903 after charging £7,408 for depreciation.

For the year ended September 30, 1957, an overall working loss was incurred of about £17,500. Depressing though these figures be, it is to be noted that of the 129 tons produced during the twelve months to September 30, 1957, approximately 92 tons were won in the September quarter. In terms of the profit and loss account, the first nine months of the year (during which 37 tons of tin concentrates were produced) resulted in a loss of approximately £36,500. But in the final three months to the end of September last (when the total output amounted to 92 tons), there was a working profit of approximately £19,000.

Bearing all these factors in mind, the chairman, Mr. F. R. Cottell, feels that before any final decision can be taken on future policy, the results of the joint venture company over a longer period should be awaited to enable a better view to be formed of its dividend-paying prospects and also of the value of the company's 49 per cent shareholding.

One point which Mr. Cottell stresses is that any material increase in production will depend on the availability to the joint company of further funds.

FINANCIAL NEWS AND RESULTS IN BRIEF

Magundi Copper Mines.—By an order of the High Court of Southern Rhodesia, dated October 22, Magundi Copper Mines and Minerals was placed under judicial management. Production is continuing. A comprehensive report will be issued by the judicial managers at a later date.

De Beers Industrial Quadruples Profits.—Net profits of De Beers Industrial Corporation in the year ended December 31, 1957, are estimated at £3,567,190. This compares with £812,994 last year, but the 1957 figure is struck after the inclusion of £2,500,000 in respect of a bonus issue received from African Explosives and Chemical Industries. The recommended dividend of 2s. per share is the same as last year.

Taquah and Obosso.—Taquah and Abosso Mines have announced a liquidation distribution of 6d. per share payable on February 15 next.

Morning Star Cuts Development.—With the object of conserving the limited cash resources of Morning Star Mines, development of the lower levels has been curtailed and is now being concentrated on the prospects which are considered to be the most favourable.

Government Areas Capital Repayment.—At an E.G.M. to be held in Johannesburg on January 23, resolutions reducing the capital of Government Gold Mining Areas to £1,260,000 in shares of 4s. 6d. each will be proposed. If the resolutions are approved, court sanction will be sought for the return of 6d. per share to holders.

Austral Malay Group Results.—Austral Malay Tin earned a profit of £27,955 before tax in the year ended June 30 last. This compares with £27,069 last year. Austral Amalgamated's profits advanced from £307,937 to £414,990, but Pungah's earnings fell back from last year's £60,564 to £32,098. Kampong Kamunting, whose dredge is inoperative pending the result of an application for a new mining lease, lost £1,870 in the same period.

Anglo's Successful Issue.—The Anglo American issue of £3,000,000 5¼ per cent convertible notes at par was subscribed to the extent of £3,140,000. Applications from Anglo's shareholders and African and European stockholders will be met in full, as will other applications up to £50,000, but any excess over that figure will be reduced by about 60 per cent.

Amalgamated Collieries Earn More.—At £903,000 before tax, the estimated profit of Amalgamated Collieries of South Africa for the year ended December 31, 1957, shows a slight advance from last year's £892,480. A final dividend of 2s. 6d. per share has been declared, making 4s. for the year. This is the same as in 1956.

Consolidated Diamonds of S.W.A.—Consolidated Diamond Mines of South-West Africa are repeating last year's distributions with a final dividend of 10s. per share, making a total of 15s. for the year. Estimated profit before tax for 1957 is £16,806,000, compared with £16,081,782 last year.

Barclays D.C. and O.—Net profit after taxation of Barclays Bank D.C.O. in the year ended September 30 last amounted to £1,161,473, against £1,261,189 last year. The chairman, Mr. J. S. Crossley, says that the reduction is not due to any falling-off in the volume of business, which was maintained in spite of the loss of the Egyptian section, but to increased costs, and, in particular, increased salaries and pensions. Meeting, London, Jan. 3.

Brittania Copper Output Cut.—Howe Sound Co. announces that operations at its Brittania Copper Mine in British Columbia are to be cut by about 40 per cent. Output will be reduced from the present level of about 750 tons per month to about 450 tons, and almost half the labour force of 800 will be laid off.

Quebec Cobalt Activity.—Quebec Cobalt's holdings in the Mount Wright region have been the subject of increased exploratory activity by the Jones and Laughlin Steel Corporation this year, according to Mr. F. W. Thompson, president of Thompson-Lundmark Gold Mines. Thompson-Lundmark has a 40 per cent interest in Quebec Cobalt.

New Guinea Goldfields.—Net profits of New Guinea Goldfields in the year ended June 30 last amounted to £70,349, compared with £139,734 in 1956. Transfers to reserves total £299,371, and £77,279 is carried forward against £306,301 brought in. Mr. J. Kruttschnitt is chairman.

Sungei Way Earnings Down.—Sungei Way Dredging earned a net profit before tax of $1,811,840 in the year ended June 30, 1957, a reduction from $2,178,453 in the preceding year. Dividends paid or recommended total 20 per cent, absorbing $960,800, which is equivalent on the new capital to last year's distributions, a scrip issue of two-for-one having been made in the meanwhile. Mr. J. H. Rich is chairman.

Central South African Lands and Mines.—Increased net earnings of £57,881 in the year to June 30 last (1956 : £46,703) enabled Central South African Lands and Mines to recommend a final dividend of 12½ per cent. This makes a total of 22½ per cent for the year, and compares with a final of 10 per cent and a total of 17½ per cent last year. The company's mining subsidiary, Afrikander Lease, continued to make progress, and the year's net profit came out at £89,981 against £63,991 previously.

Van Ryn Winds Up.—At an E.G.M. held in Johannesburg last month, Van Ryn Gold Mines Estate was put into voluntary liquidation. From the balance sheet at June 30, 1957, it appears that distributable assets after deduction of liabilities amounted to some £353,686, equivalent to about 14s. 3d. per 1s. share. It seems, however, that liquidation will take some considerable time to complete, because much of the above total consists of sums payable on extended terms.

New Monteleo.—In the year ended June 30, 1957, New Monteleo made a net profit of £13, compared with a loss of £792 in the previous year. New Monteleo holds a substantial block of shares in Natal Coal Exploration Co., as well as mineral rights adjacent to the Buffelsfontein and Merriespruit lease areas. Mr. J. Robinson is chairman.

Geomines Production.—Geomines, the largest of the Congo tin producers, produced 3,805 tons of cassiterite in the year ended June 30, compared with 4,007 in the preceding year. Tin-in-ingots, however, showed an increase from 2,812 tons in 1956 to 2,919 this year. Figures for tantalum-columbite were 1956: 200; 1957: 115.

Heidelberg Estates Buys Kaffirs.—Heidelberg Estates' operations in the year ended June 30 last resulted in a loss of £4,431, compared with a profit of £108 in 1956. During the year the directors decided to sell the undated gilt-edged held by the company and to reinvest in the shares of gold mining companies.

Temoh an O.T.C.—At last week's annual meeting of Temoh Tin Dredging, the chairman, Mr. R. Ellerton Binns, said that notice had been received that the company could thenceforward be regarded as an overseas trading corporation.

New Kleinfontein.—The New Kleinfontein Co. is to declare no dividend this year. Last year's distribution was also passed.

R.S.T. Group.—An informal meeting of members of Rhodesian Selection Trust

(*Continued on page* 782)

KENTAN GOLD AREAS

EARL GREY'S REVIEW

The Annual General Meeting of Kentan Gold Areas, Limited, was held on December 23 in London.

The following is the circulated statement of the Chairman, **The Rt. Hon. Earl Grey:**

Operations at Geita during the year under review have again been severely handicapped by power shortages and by the reconstruction programme which was stated in April, 1956. These difficulties are referred to in detail by New Consolidated Gold Fields, Limited, the Technical Managers of the Geita Company, in their Report which is attached to the Accounts.

In July, 1957, after very careful consideration, New Consolidated Gold Fields, Limited, and ourselves decided to embark upon a further Programme of Capital Expenditure at Geita. The funds necessary to finance this Programme were estimated at £200,000 and were provided jointly by New Consolidated Gold Fields, Limited, and your Company. Your Company owes a debt to its associated Companies, Tanganyika Concessions, Limited, and the Zambesia Exploring Company, Limited, who made it possible for Tanganyika Holdings, Limited, to provide our share of the cash required. Since September, 1953, £575,000 of new finance has been provided to the Geita Gold Mining Company, Limited, of which £237,500 has been provided by Kentan Gold Areas, Limited, with the assistance of the abovementioned Companies.

Position at Geita

The position now is that the Technical Managers consider that the Mine can be brought to a milling rate of 30,000 tons a month by July, 1958, and that to reach this rate and maintain it, the ore pillars above 6 Level must be systematically and rapidly extracted, while a new subvertical shaft must be started immediately to be ready to hoist ore from 9 Level to 8 Level not later than April, 1960, and ore from 10 Level to 8 Level not later than July, 1961. Provided that there is no further inflation in working costs, it is expected that the Mine can be brought to a profit-accumulating position by mid-1960 without further calls for finance, and in this connection New Consolidated Gold Fields, Limited, have informed us that their present advance of £100,000 will be their final contribution to the finances of the Geita Company.

Shareholders will note that the above estimate is provisional on there being no further inflation of working costs. Since 1953, the Technical Managers' estimate of the profit potential of the Geita Mine when operating at a milling rate of 30,000 tons a month, has been reduced from £6,600 a month to £2,500 a month, and it is clear that if such a trend were to continue, the development of the Geita goldfield would have to cease.

I think, however, that there are signs both in the United Kingdom and in the United States of America of a determination to maintain the purchasing power of the currency, and we hope that shareholders will agree with our determination to continue with the Geita project so long as there is a gleam of hope that inflationary trends will be reversed.

The Report and Accounts were adopted.

LAKE VIEW AND STAR LIMITED

The Forty-seventh Annual General Meeting of Lake View and Star, Limited, was held on December 19 in London.

Sir Joseph Ball, K.B.E. (the Chairman), in the course of his speech, said:

The Company has been advised by the Inland Revenue that it qualified provisionally as an Overseas Trade Corporation as from April 6, 1957. As a result, all categories of Shareholders will benefit in varying degrees.

The taxation benefits arising from our new O.T.C. status may conveniently be divided into two separate categories: the first being what perhaps I may describe as "non-recurring" benefits.

Firstly, there is a large reduction this year in the amount provided for U.K. taxation on mining profits, which at £115,000 compares with a figure of £235,500 last year. This reduction is due almost entirely to the altered basis on which the Company will be assessed as an O.T.C.; and I would point out that on this occasion the tax charged is less than would normally be the case, owing to the initial advantages obtained during the change-over period.

Secondly, the provision which had already been made for income tax for 1957-58 on mining profits, amounting to £158,000, is no longer required, and has therefore been written-back to the credit of Profit and Loss Appropriation Account.

As a result of these reliefs, we are in a position to increase the total dividend for the year to 2s. 6d. per share, whereas but for them we should not have been able to pay Shareholders more than 1s. 9d.

I will now draw your attention to what perhaps I may call "recurring" or "permanent" benefits. Provided that we remain qualified as an O.T.C., we shall, in future, pay no profits tax either on distributed or undistributed mining profits; and we shall only be required to pay U.K. income tax of an amount equal to that which has to be deducted from the dividend payments. On non-mining profits, however, income tax and profits tax will continue to be charged as heretofore.

The Company will obtain substantially the same tax benefits as would have resulted from emigration; and the application for transfer of domicile, which was submitted to the Treasury in January last, has therefore been withdrawn.

On the basis of current profits, your Directors feel reasonably sanguine of being at least able to maintain the present dividend of 2s. 6d. per annum; and whether or not it will be possible to increase this rate of distribution must depend largely upon what, if any, additional capital expenditure may be found necessary.

The Company is under an obligation to deduct income tax at the standard British rate from all dividend payments, irrespective of the residence or domicile of the Shareholder. Shareholders resident overseas, however, will be able to claim repayment of tax which has been deducted but for which they are not legally liable; and, in this connection, Shareholders resident in Australia, where no tax whatever is imposed on profits from gold mining, will in future be in a very enviable position.

Arrangements have been made to send out tomorrow, with the dividend warrants, as full an explanation regarding the tax provisions relating to dividends as it is possible to compile at this stage. As soon as the full Inland Revenue regulations are received, a further circular will be issued to Shareholders.

The profit from mining operations at £419,000 was £25,000 lower than that for the preceding year.

It is possible that it may be necessary for the Company to incur further capital expenditure of a substantial amount; and, in these circumstances, it was deemed prudent for the time being to transfer to Reserve the sum of £170,000.

The total dividend for the year is 2s. 6d. per share, as compared with 2s. last year.

Ore reserves on July 1, 1957, amounted to 3,577,000 tons at an average grade of 4.78 dwt. per ton.

The tonnage milled, at 744,515 tons, was 3,997 tons higher than the previous year, and was the highest throughput in the Company's history. This resulted in an increase in gold production which at 159,625 oz. rose by 1,263 oz.

During the year the cost of stores and equipment continued to rise and, in addition, the basic wage was increased by a further 8s. 6d. per week. As a result, there was a rise in working costs of 1s. 1d. per ton. In the circumstances this was, I fear, inevitable, but I would emphasize the fact that, in spite of persistent increases in the general cost structure for a number of years past, this is the first rise which has occurred in working costs per ton since 1953.

The report and accounts were adopted.

News and Results—*Continued.*

and Roan Antelope Copper Mines will be held in London at 11.30 a.m. on Thursday, January 9, 1958, to enable members who live in the United Kingdom to receive a report from the chairman, Sir Ronald L. Prain, and to give them an opportunity of asking questions. This meeting will in no sense be a formal general meeting of the companies. No resolutions will be submitted and members will not be able to exercise any voting rights.

Alpine (Barberton).—The Alpine (Barberton) Gold Mine reduced its 1956 loss of £5,924 to £942 in the year ended June 30 last. The directors are still trying to find a fresh mining operation in which the company could take an interest, but, they say, it is premature to make a statement. Meeting, London, January 15.

Pots. Do Well — For The Nonce.—The year ended August 31, 1957, was a prosperous one—perhaps the last for a while — for Potgietersrust Platinums, holder of 43.3 per cent of the equity of Rustenburg. Net profit before tax rose to £818,991 from £724,762, and the dividends paid were accordingly advanced from 1s. 2d. to 1s. 3d. Meeting, Johannesburg, January 30. Mr. D. A. B. Watson is chairman.

Union and Waterval Platinum.—Both Union Platinum and Waterval Platinum, who control the remainder of the Rustenburg capital, also improved on their 1956 results. Union increased its net profit from £296,018 to £334,275, while Waterval's rose to £800,015 from £709,790. These meetings will also be held in Johannesburg on January 30.

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Publications Received

Records of the Geological Survey of Tanganyika, Volume III, contains progress reports and articles covering the year 1953.

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A *Lexicon of the Stratigraphy of Tasmania*, compiled by Edith M. Smith, has been issued by the Commonwealth of Australia, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics.

★

The Aluminium Development Association, 33 Grosvenor Street, London, W.1, has issued a new edition of its *List of Publications*, covering Information Bulletins, applications brochures, research reports, and reprinted papers and articles.

★

Publications received from the Geological Survey of India include *Memoirs, Volume* 83, *Petrology of Indian Coals* (Rs.5 or 8s.); *Memoirs, Volume* 84, *Part I, a Revision of the Geology and Coal Resources of the Raiganj Coalfield* (Rs. 7-12 or 12s. 6d.); *Records, Volume* 83, *Part* 2, 1954 (Rs.4-14 or 7s. 9d.), and *Records, Volume* 82, *Part* 4, 1956 (Rs.3 or 5s.).

★

A *Bibliography of Titanium Deposits of the World*, by Robert Lawthers and Helen R. Mark, has been issued by the United States Department of the Interior as Geological Survey Bulletin 1019-G. Copies are obtainable from the Superintendent of Documents, United States Government Printing Office, Washington 25, D.C. Price 25 cents.

★

A rapid and inexpensive field chromatographic method for determination of trace quantities of uranium in soils and rocks is described by Charles E. Thompson and H. W. Lakin in Geological Survey Bulletin 1036-L, United States Department of the Interior. For sale by the Superintendent of Documents, United States Government Printing Office, Washington 25, D.C. Price 15 cents.

★

The Law Relating to Safety and Health, Volume III, Miscellaneous Mines (H.M.S.O.: price 5s. 6d. net), contains all the statutory provisions of general application relating to safety and health at mines other than of coal, stratified ironstone, shale or fireclay, under the Mines and Quarries Act, 1954, which came into operation with the Act itself on January 1, 1957, either because the Act continued them in force or because they were made so as to have effect on that date. There are companion volumes for other mines and for quarries.

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The Geology of the Country Between Belingwe and West Nicholson, by B. G. Worst, M.Sc., has been issued by the Southern Rhodesia Geological Survey as Bulletin No. 43. The Belingwe District was formerly known principally as a gold mining area, but in recent years the gold output has declined greatly and asbestos has become the chief mineral product. Chrome has been mined from time to time near the southern end of the Great Dyke and there are important deposits of limestone.

★

Britain is Nigeria's best customer and principal supplier, but the growing purchasing power of her people and industrial expansion are attracting foreign traders in increasing numbers. A detailed description of this territory as a market for British exports is given in a new survey, *Economic and Commercial Conditions in Nigeria*, prepared by the United Kingdom Trade Commissioners in Lagos and published for the Board of Trade by H.M.S.O., price 10s., by post 11s. 3d. Nigeria is the United Kingdom's largest dependency and provides a market for a very wide range of articles. Current public and private development plans are expected to maintain a strong demand for constructional material in particular.

Nigeria possesses important deposits of cassiterite, columbite and coal. Recently after many years of intensive investigations, promising indications of petroleum have been encountered. Iron ores exist and may eventually be worked if suitable smelting processes can be devised. Mining and minerals are the responsibility of the Federal Government, but royalties are returned to the regions on a derivation basis.